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**U.S. EPA Environmental Technology Verification (ETV) Program**  
Materials Management and Remediation Center

Summary of the Materials Management Stakeholder Committee Teleconference  
Wednesday, July 29, 2009

**Present at Role Call:** Carlos Pachon (EPA), Eric Stern (EPA, Region 2), Erica Becvar (USAF), Jennifer Griffin (NEWMOA), Jim Harrington (NY DEC), Lynn Rubinstein (NERC), Marvin Unger (HydroGeologic, SERDP/ESTCP), Richard Carmichael (TX CEQ), Robert Phaneuf (NY DEC), Teri Richardson (EPA), Truett Degeare (EPA), Andrea Zajac (MI DEQ), Golam Mustafa (EPA Region 6), Paul Kaspar (EPA, Region 6), Brian Knapp (API), John McKernan (EPA), Fran Krammer (EPA), Andrea Barbery (EPA OUST), Tim Smith (EPA OUST), Paul Miller (EPA OUST), Amy Dindal (Battelle), Maria Gordon (Battelle), Barry Hindin (Battelle), Tim Hutson (Battelle), Mark Perry (Battelle).

**Introduction of New Participants**

Maria Gordon (Battelle) asked the new stakeholders on the call—Truett Degeare, Lynn Rubinstein, Eric Stern, and Marvin Unger—as well as the presenters and observers—Golam Mustafa, Andrea Barbery, Andrea Zajac, and Brian Knapp—to introduce themselves and describe their work and interests.

**Welcome**

Teri Richardson (EPA) welcomed the new and returning stakeholders on the Materials Management Committee. She pointed out that there has been increased activity in this area since the last teleconference. Judging from vendor interest and calls from the user community, the priorities set by this committee are on target.

**ETV MMR Center Update on Activities**

Referring to the slides provided to all participants, Amy Dindal (Battelle) provided an update on what the Center has accomplished since the last meeting of the Materials Management Committee (March 31, 2009):

- Because it is not always clear whether contaminated materials, their sources, and potential solutions fall within the purview of a particular ETV Center, Amy Dindal (Battelle) reviewed the materials management scope of the MMR Center: recycling, beneficial use of waste materials, recovery of useful components of waste, and treatment to minimize disposal requirements. Waste-to-energy technologies are **not** verified under MMR.
- An external MMR Center SharePoint has been set up so that stakeholders can easily access electronic information such as meeting agendas and slides, technical information on technologies of interest, and stakeholder contact information.
- To introduce a targeted audience to the existence and mission of the MMR Center, Battelle staff attended and made presentations on the ETV MMR Center at the ITRC Spring Meeting,

the ASTSWMO Mid-Year Meeting, the Texas CEQ Trade Fair & Conference, and the Battelle Bioremediation Conference.

- The Remediation Committee met (June 30, 2009) and identified priority areas: fracturing, pressure pulsing, bioremediation, reactive capping, and in-situ chemical oxidation.
- Battelle staff have been talking to potential collaborators and vendors following up on priority areas identified during the March 31, 2009 call.
- Battelle staff have been fielding inquiries from new technology vendors with interest in verification testing under the ETV MMR Center. These inquiries were shared with the stakeholders on the call.

### **Verification Testing of Anti-Corrosion Tank Sprays**

Barry Hindin (Battelle) presented detailed information on spray processes from two different vendors—Albah Manufacturing Technologies and Sprayroq, Inc.—interested in verification testing of their products. The stakeholders were able to follow the presentation on slides received before the teleconference.

- Albah's Cold Spray Process for repairing and protecting underground and aboveground storage tanks (USTs and ASTs) was first discovered in the USSR in 1982 and then brought to the U.S. in 1994 for further development. According to the vendor, supersonic gas jet accelerates solid particles to a very high velocity. High velocity impact with a metal surface induces plastic deformation of the particles and promotes bonding to the underlying material. Particles remain at temperatures well below their melting point; the bonding occurs while in the solid state. Since the cold spray can deposit materials at low temperatures, it virtually suppresses any metallurgical transformation in either the deposited or substrate materials. In the context of the MMR Center, Hindin thought the process has potential application in restoration, leaking sealing, and corrosion protection. First, however, we have to determine: what metals or alloys can be applied by this process; what are the surface pre-cleaning requirements; what is the environmental impact of lost overspray particles; what is the cost-effectiveness of the process. He outlined a verification plan and asked stakeholders whether a field test was necessary and whether they could suggest test collaborators for field testing.  
**Discussion:** Marvin Unger (HydroGeologic) referred to the schematic presented in Slide 10 and asked at what temperature was the material applied, and what was the heat effect on the structural integrity of the object. Barry Hindin (Battelle) assumed a temperature of 600° - 700° F using aluminum. Marvin said the coating results were impressive on the car dent (Slide 12), but tanks hold solvents, so what effect does the process have on tanks that have been used for containment of liquid solvents and may have experienced some level of corrosion over time? Amy remarked that Albah wants testing, but should the MMR Center do field testing? The vendor is ready to pay for lab testing; field testing is more expensive. We need stakeholder input. Marvin said that any field conditions that can be mimicked on the bench scale will help identify site specific operational limitations and thus, make the subsequent pilot-scale testing more cost effective. Do as much as possible at the lab bench level to reduce potential liabilities during full-scale operational deployment. Paul Miller (EPA OUST) asked about the compatibility of the spray process with corrosion-resistant coatings on tanks. The underground spaces around the tanks are tight. Can the spray be effectively applied? Barry replied that the coating is manually sprayed. Amy added that they have a robotic system as well. Andrea Zajac (MI DEQ) commented that there are companies

already out there who open up and spray tanks, so there is much experience with accessing tanks. Stakeholders provided concurrence for proceeding in this area.

- Sprayroq's SprayShield Green is a polymer-based solution for coating and "rehabilitating" storage tanks (used mostly for manholes, to date). The 100% polyurethane coating is "bio-based" (NSF 61 product; meets or exceeds USDA minimum standard for BioBased content). It can be sprayed to 0.5 in. thickness in a single application using a proprietary heated plural component spray system. It gels in 8 s, is tack-free in 1 min, cures in 30 min, and continues curing for 4 to 6 hr. For optimum performance, surface temperature should be between 55° and 122° F. The vendor claims the product is free of VOCs. The product has been used to coat steel, concrete, masonry, and fiberglass. Hindin said the product would follow a verification plan similar to one laid out for the Albah product.

**Discussion:** Stakeholders offered concurrence for proceeding in this area but no additional comments. Barry Hindin is looking for peer reviewers for the Sprayroq Test/QA Plan.

### UST Leak Detection Equipment

Andrea Barbery (EPA OUST) spoke about underground storage tank leak detection (LD) equipment, specifically performance verification with ethanol-blended fuels. The stakeholders were able to follow the presentation on slides received before the teleconference.

There are about 617,000 underground storage tanks at about 233,000 facilities in the U.S. About 7,400 releases (leaks) occur each year. All regulated tanks and piping must have release (leak) detection so that leaks can be found quickly before contamination spreads beyond the UST site. EPA/ORD has developed test protocols for the various leak detection methods. About 90% of stations use Automatic Tank Gauging (ATG) systems. The problem is that these protocols were developed in the early 1990s before the use of biofuels became widespread, so the current protocols do not test with ethanol blends. Today, ethanol has replaced MTBE and is blended into 75% of all the gasoline consumed in the U.S.: most is E10 (10% ethanol, 90% gasoline), some is E85 (85% ethanol, 15% gasoline). Most LD technologies were developed to detect releases of petroleum and to detect the presence of water in petroleum. Since petroleum and ethanol have different chemical and physical properties, the current LD methods may not work properly. For instance, since water and petroleum do not mix, the water drops to the bottom of the tank. In Florida, where there are high groundwater levels, water in a tank may indicate a breach in the tank. If, however, the tank holds an ethanol-blended fuel, then, since water and ethanol do mix, it will not be possible to detect the presence of small amounts of water, by which time the fuel is diluted with water and unusable. EPA OUST is interested in the ETV program's assistance with determining whether the current LD methods can reliably monitor leaks with biofuels, reviewing current protocols to see areas that may be affected by biofuels, and recommending updates to the protocols to accommodate biofuels.

**Discussion:** Andrea Zajac (MI DEQ) remarked that Michigan has a great need for this kind of protocol analysis since the state has installed high ethanol tanks. Brian Knapp (API) is very interested in the problems for ATG posed by higher ethanol fuel blends. Amy Dindal (Battelle) mentioned that EPA is still determining how supporting EPA OUST will fit among the ETV centers.

## Recycling Copper Mine Tailings

Tim Hutson (Battelle) spoke about Lesktech Limited, a small business that has obtained an EPA Small Business Innovation Research (SBIR) award to convert the environmentally problematic copper mining waste “stamp sand” into beneficial, algae-resistant, roof granule material. The stakeholders were able to follow the presentation on slides received before the teleconference.

In Phase I of the EPA SBIR project four questions were examined: Do the physical and chemical properties of G-sand (stamp sand) meet the specification for roofing materials? Is it environmentally safe for roofing applications? Does G-sand have anti-bacterial properties? Can the product be introduced into the market place at a cost-competitive price? There are an estimated 500 million tons of stamp sand on the Keweenaw Peninsula in Michigan, 200 million tons of which is located near the town of Gay. The stamp sand is primarily basalt and is derived from metallic copper ore. About 13% of particles is smaller than 40 mesh, and 13% is greater than 8 mesh. Copper concentration ranges from 0.02% to 1.12%. The sand particles share many characteristics with typical roof granules (specific gravity, bulk density, Mohs hardness, moisture, oil absorption). In Phase I Lesktech processed 5 tons of stamp sand in its pilot facility and found that growth of three bacterial species were inhibited by the sands, and they showed no leaching of heavy metals of environmental concern. Trials suggested that 80% of the stamp sand can be reclaimed and the product would come in at considerably less cost per ton than commercial roof granules. As part of the Phase II project, Lesktech will execute a verification option in which the performance of the stamp sands will be tested under the ETV program as roofing granules in the manufacture of roofing shingles. This Phase will determine silane coating thickness on treated granules, measure water absorption/resistance of treated and untreated granules, assess granule-to-asphalt adhesion for roofing materials, and color, brightness and reflectivity of white reflective coatings on G-sand granules. Tim asked for stakeholders to volunteer to review the test/QA plan and report.

**Discussion:** Truett Degeare (EPA) said this sounded like an innovative market development and wants to see the Phase I report. In response to Truett’s question about the silane coating, Tim Hutson (Battelle) said the silane treatment is to limit water absorption. Mark Perry (Battelle) added that silane is a coupling agent to aid adhesion. Lynn Rubinstein (NERC) asked whether you do an independent assessment of manuals to see if they’re appropriate. Mark replied that Lesktech works with four roofing companies, who adhere to Asphalt Roofing Manufacturers Association (ARMA) standards. Amy added that we have technical experts reviewing our test/QA plans who confirm that the standards being used for testing are appropriate. Truett Degeare commented on leach testing. The Great Lakes area has high arsenic levels in the soil. Bob Phaneuf (NY DEC) would like to see what other compounds are in the sand. Also, test to see what’s in a commercial shingle. Tim said some shingles are now manufactured with copper added. Mark added that there are 60 elements monitored in the Phase I report. Truett Degeare and Bob Phaneuf agreed to serve as reviewers of the test/QA plan and report.

## Discussion of Progress in Materials Recycling Categories

Amy Dindal (Battelle) presented an update on the following categories:

- Tire Recycling  
We are pursuing a verification test of one or more scrap tire technologies at the U.S./Mexico border. We are responding to an RFP from EPA Region 6 Border 2012 Program (Border Environment Cooperation Commission). Award notifications will be made in October 2009.



Teri Richardson mentioned that she heard recently from a company with a tire recycling technology—Pellitech – who had interest in verification testing.

**Discussion:** Truett Degeare (EPA) is interested in the market for scrap tires. He has not seen reports that confirm the usefulness of tire pyrolysis, and there is controversy over the use of shredded rubber treads, etc. in athletic fields. Amy Dindal (Battelle) agreed to send a fact sheet to Truett on a tire processing and reclamation facility in Oregon that was discussed on the last conference call (<http://www.oregon.gov/DEQ/ER/docs/Reclaim.pdf>). Bob Phaneuf (NY DEC) said that Dr. Lee Lim has looked at exposure from crumb rubber in playgrounds. Lynn Rubinstein (NERC) said there is a link to the report on their website.

- **Electronics Recycling**

There are no federal laws or mandates beyond the existing hazardous and solid waste laws established in the 1970s and 1980s. Only 15-20% of electronic waste is being recycled, and there is concern about the hazardous materials they contain (mercury, lead). The U.S. House of Representatives currently has draft legislation that addresses the electronic waste problem. California places a tax on the buyer at the time of purchase for future handling of the waste. Maine places the responsibility on the original equipment manufacturer. There are multiple processes for recycling a variety of materials. There are large and small businesses who are clients for the raw materials recovered in the recycling process. Amy provided a list of e-waste recycling vendors in Slide 52. ECS Refining is interested in verification testing. The Navy is interested in electronics and cardboard recycling, particularly at the Pearl Harbor site.

**Discussion:** Lynn Rubinstein (NERC) said that Hawaii's take-back bill has just become law without the governor's signature. She has the contact name for the Hawaii person.

- **Cardboard Recycling**

There are accredited processes for cardboard recycling, and Amy provided a list of cardboard recycling vendors in Slide 53.

**Discussion:** Lynn Rubinstein commented that electronics recycling has more technology development associated with it, whereas cardboard recycling technologies are less novel. With electronics recycling the need and opportunities are greater. Amy noted that there was a higher stakeholder interest in electronics rather than cardboard recycling.

### **I-10 Twin Bridge—Concrete Reuse**

Golam Mustafa (EPA Region 6) spoke about the beneficial reuse of I-10 Twin Span Bridge concrete for restoring Louisiana's coastal environment. The stakeholders were able to follow the presentation on slides received before the teleconference.

After Hurricane Katrina the bridge was damaged, and Louisiana decided to reuse the material for restoration of the coastline rather than putting it into a landfill. Bridge debris (including bridge deck and guard rails, bridge piles and pile caps) will be mechanically reduced into smaller sizes to utilize as wave breakers, riprap, and filling materials for shoreline protection. Unwanted material, such as steel beams, will be removed before breaking the concrete into smaller pieces. The bridge was constructed of concrete reinforced with steel bars. The I-10 bridge produced 263,000 tons of structural concrete, which when reused for coastal restoration, would result in a savings of \$8 million in stone costs alone, a GHG emission reduction of 12,161 MTCO<sub>2</sub>E, and total energy savings of 166,880 million BTU. The MMR Center is pursuing a verification of this concrete beneficial reuse. A verification test might assess the durability of concrete in seawater.

Region 6 has suggested performing a tank leach test of the deconstruction materials to evaluate any potential environmental risk. Relevant references/standards have been identified.

**Discussion:** Mark Perry (Battelle) said that accelerated aging of concrete in water over time—a leach test—has been conducted according to Dutch, EU, and German standards, looking at pH, temperature, time. Truett Degeare (EPA) said that they like to see high volume material put to good use. Jennifer Griffith (NEWMOA) agreed, and said there is now a push to put recycled material into concrete. Can you test different concretes with different materials? Golam Mustafa replied that on this site, all is bridge concrete and that records of its composition aren't readily available since it was built 60 years ago. Many parts of the bridge were pre-formed (the deck), but the pylons may have been poured on site. If the bridge is not reused for anything, it will go into a landfill. Paul Kaspar (EPA, Region 6) asked whether anyone had experience with similar coastal applications. Lynn Rubinstein (NERC) replied that the entire eastern coast of Japan has poured mold concrete objects in the ocean. Mark Perry (Battelle) said there are ASTM standards for testing concrete and seawater exposure.

### Stakeholder Input to Vendor Inquiries

Amy Dindal gave a brief overview of several new vendor inquiries.

- MedClean Technologies  
Vendor processes regulated medical waste (RMW—solid waste, paper towels, etc.) on-site. Vendor willing to financially support verification testing.  
**Discussion:** Lynn Rubinstein (NERC) remarked that there is a pretty significant environmental need. Medical incinerators are mostly closed because of environmental issues. Waste is going to landfills where it propagates exposure to workers and the environment. There was stakeholder concurrence to proceed in this area.
- Garment Recovery Systems  
Vendor buys back Tyvek<sup>®</sup> coveralls and puts them through a 12-step cleaning process, then resells them back into industrial environments. Vendor is interested in verification testing, but funding is currently problematic.  
Discussion: Lynn Rubinstein loved this one. It's a problem NERC has encountered. Tyvek<sup>®</sup> has its own program for recycling. There was stakeholder concurrence to proceed in this area.
- Haselden Recovery Systems  
Vendor eliminates waste in beverage production facilities by reintroducing it back into the production process. This is a biochemical oxygen demand (BOD) wastewater treatment process. According to the vendor, more than 70% of the beverage plant BOD comes from sugar based products. We may be able to piggy-back testing at manufacturing facilities.  
**Discussion:** None.
- Other  
Truett Degeare (EPA) mentioned that building companies are now using brick made from coal ash. He cited Pittsburgh Mineral and Environmental Technology, Inc. and offered to send more information.

## Review of Action Items and Next Meeting

### Action Items

- Battelle: Address the following issues concerning Albah's Cold Spray Process:
  - Need to consider storage fluid material compatibility and liquid containment, especially with new fluids (e.g., E85 higher ethanol content).
  - Need control standards for comparison.
  - Need to consider influence on substrate and structure.
  - Application temperature is important.
  - Confirm that confined space entry is done routinely, and will not be an obstacle.
- Battelle: Provide Phase I report of Lesktech's stamp sand reuse project. See Stakeholder SharePoint for more information.
- Truett Degeare and Robert Phaneuf: Serve as reviewers of Lesktech's test/QA plan and report.
- Lynn Rubinstein: Provide link to crumb rubber report from NERC website. See Stakeholder SharePoint for more information.
- Truett Degeare: Provide links and files on NY crumb rubber reports. See Stakeholder SharePoint for more information. Provide information on coal ash reuse.
- Lynn Rubinstein: Provide name of Hawaii contact for state electronics recycling policy--[jennifer.tosaki@doh.hawaii.gov](mailto:jennifer.tosaki@doh.hawaii.gov) - Hawaii Department of Health.
- Battelle: Address the following issues concerning concrete reuse
  - Need control standards for comparison.
  - Need to determine or analyze concrete composition.
  - Need to determine or analyze sea water composition.

The Materials Management Committee will meet again in November/December at a date to be determined.

### Adjourn

Respectfully submitted,  
Maria Gordon  
Battelle Stakeholder Coordinator  
ETV MMR Center